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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,241	06/24/2003	Shui-Ming Cheng	TSM02-1262	1141

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SLATER & MATSIL, L.L.P.
17950 PRESTON RD, SUITE 1000
DALLAS, TX 75252-5793

EXAMINER	
LINDSAY JR, WALTER LEE	
ART UNIT	**PAPER NUMBER**
2812	

DATE MAILED: 06/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/602,241	CHENG ET AL.	
	Examiner	Art Unit	
	Walter L. Lindsay, Jr.	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-14 is/are pending in the application.

4a) Of the above claim(s) 15-20 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-4,6,8-11 and 13 is/are rejected.

7)☒ Claim(s) 5,7,12 and 14 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 3/22/04.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to an Election made on 4/29/2004

Currently claims 1-14 are pending and claims 15-20 have been withdrawn.

Election/Restrictions

1. Claims 15-20 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 4/29/2004.

Specification

2. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1-4, 6, 8-11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi (US Patent No. 5,949,105 dated 9/7/1999) in view of Fulford, Jr. et al (US Patent No. 6,258,680 dated 7/10/2001).

Moslehi shows the method substantially as claimed, in figs. 3-6 and corresponding text as: forming a gate oxide (50) over a substrate (8) and a gate electrode (46,48,56,58) over the gate oxide (50) (col. 4, line 60-col. 5, line 15); implanting impurities into the substrate using the gate electrode as an implant mask to form lightly-doped regions(16, 24) in the substrate (col. 5, lines 24-34); forming a first spacer (62) adjacent the gate electrode (col. 5, lines 43-50); implanting impurities into the substrate and through a portion of the lightly-doped regions using the first spacer as an implant mask to form deep source/drain regions (14, 22) in the substrate (col. 5, lines 58-62); forming a second spacer (64) adjacent the first spacer (col. 6, lines 6-12); removing the second spacer (col. 6, lines 45-49) (claim 1). Moslehi shows the method as claimed: forming a gate oxide (50) over a substrate (8) and a gate electrode (46,48,56,58) over the gate oxide (50) (col. 4, line 60-col. 5, line 15); implanting impurities into the substrate using the gate electrode as an implant mask to form lightly-doped regions(16, 24) in the substrate (col. 5, lines 24-34); forming a first spacer (62) adjacent the gate electrode (col. 5, lines 43-50); forming a second spacer (64) adjacent the first spacer (col. 6, lines 6-12)(claim 8).

Moslehi lacks anticipation only in not explicitly teaching the method of: 1)implanting impurities into the substrate using the second spacer as an implant mask

to form a graded source drain region in the substrate (claim 1); 2) a first spacer comprising a nitride (claims 2 and 9); 3) a second spacer comprising an oxide (claims 3 and 10); 4)the second spacer is a low-temperature oxide having a thermal budget of less than 600°C. (claims 4 and 11); 5)further including forming a salicide over the source/drain regions (claims 6 and 13); and 6)implanting impurities into the substrate using the second spacer as an implant mask to form a graded source/drain region in the substrate; removing the second spacer; and implanting impurities into the substrate and through a portion of the lightly-doped regions using the first spacer as an implant mask to form deep source/drain regions in the substrate (claim 8).

Fulford, Jr. teaches a method in a similar semiconductor device of forming spacers 136 and 138 of a nitride and forming implant regions 142 and 144, in the substrate by using the spacers as a mask (col. 8, lines 23- 48). Fulford also shows the formation of spacers 148 and 150 of an oxide that are formed by a number of different processes, which are use to form implant regions 154 and 156, in the substrate by using the spacers as a mask (col. 8, line 49- col. 9, line 3). Fulford also shows the formation of the first and second spacers an implant and then the subsequent removal of the second spacer followed by another implant, in order to form a graded source/drain (col. 10, line 54- col. 11, line 9). Fulford also teaches that silicide is formed on the source/drain region and the gate conductor (col. 11, lines 56-63).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made to modify the method shown in Moslehi, by using the spacer formations and implants of Fulford, Jr., with the motivation that both Moslehi and

Fulford, Jr. attempt to provide superior protection against the hot carrier effect when compared to traditional LDD structures, and also to avoid exposing the LDD implants to high temperature cycles which would give rise to excessive migration.

Allowable Subject Matter

6. Claims 5, 7, 12 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter: the prior art, either singly or in combination fails to anticipate or render obvious, the limitations of:

...further including depositing a nitride layer over the gate electrode and lightly-doped regions and forming the first spacer from the nitride layer, and further including depositing an oxide layer over the gate electrode and lightly-doped regions and forming the first spacer from the oxide layer, as required by claims 5 and 12.

Lastly the prior art, either singly or in combination fails to anticipate or render obvious, the limitations of:

...forming an interconnect in said contact opening, the interconnect being electrically coupled to the deep source/drain regions, as required by claims 7 and 14.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter L. Lindsay, Jr. whose telephone number is (571) 272-1674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John F Niebling can be reached on (571) 272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WLL
June 9, 2004

John F. Niebling
Supervisory Patent Examiner
Technology Center 2800